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STATUS OF MISSILE AND SPACE PROGRAMS

REPORT

OF THE

COMMITTEE ON SCIENCE AND ASTRONAUTICS

U.S. HOUSE OF REPRESENTATIVES

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LETTER OF TRANSMITTAL

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C., May 28, 1959.

Hon. OVERTON BROOKS,
Chairman, Committee on Science and Astronautics.

DEAR MR. CHAIRMAN: I am forwarding herewith for committee consideration a report on "Status of Missile and Space Programs" prepared by Dr. Charles S. Sheldon II, technical director, and reviewed by the rest of the professional staff.

The report is based on both open and executive session hearings before the full committee, with leading administrative, military, and technical officials from the principal military and civilian agencies of Government concerned with these programs. The report summarizes highlights of the testimony and the principal reactions of the committee to what it was told.

CHARLES F. DUCANDER,
Executive Director and Chief Counsel.

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STATUS OF MISSILE AND SPACE PROGRAMS

INTRODUCTION

This is the first session of the Congress during which the newly created standing Committee on Science and Astronautics has been active. Its creation is a reflection of the changing times in which we live, when science and technology are playing the key roles in determining the pattern of our economic life and especially in determining our strategic political and military place in the world. Our concentration on science and its applications will control our national survival in the race not only with the Soviet Union, but in a sense with ourselves and our social and natural environments.

This committee approached its new tasks with an appreciation of their gravity. It recognized that there should be some focal point in the Congress where all the interrelated policies of science and technology with their widespread ramifications could come together for review, study, and legislative recommendation. These coordinating study functions have been accompanied by specific legislative responsibilities for the National Aeronautics and Space Administration, the National Science Foundation, and the National Bureau of Standards. In a functional sense, as specified by the resolution creating it, the committee is responsible for basic science activities across the board wherever they may occur, and also for all problems and activities related to space.

Accordingly, the committee, composed both of experienced legislators and of new Members of the Congress, decided to start committee activities with a thorough review of our missile and space programs, the most striking example of the new force of technology on the national scene. By this means, the committee expected to acquaint itself with the policy problems involved, with a view to better execution of its legislative role. This review has given the members of the committee a grasp in general outline of what it and the Congress must understand. It has certainly also paved the way to better legislative oversight of authorizations for the NASA—the recommendations and legislation for which have already been forwarded to the House, and enacted by that body.

Although these survey hearings were begun promptly on February 2, and included 22 sessions up to March 12, the committee has not wished to rush prematurely to conclusions before a comprehensive understanding of the subject could be acquired and agreed to. Therefore, hearings on a number of related subjects on which separate reports have been or will be prepared were held prior to the submission of this particular report, and have contributed to the understanding necessary to prepare it.

GENERAL REMARKS

As stated above, the committee approached its work with genuine concern and appreciation of the urgency of making correct policy decisions on missiles, space, and science in general. The work it has conducted has sharpened and strengthened these views.

The committee entered into its work at a time when the public was confronted with a confusion of charges, claims, and counterstatements, leaving anything but a clear picture of where we stand in our struggle to assure the defense of the Nation and to promote its well-being through science and technology. As a result of these hearings it is possible now to report a few conclusions—points which are relatively simple but fundamental. These points are agreed to by the committee without regard to any partisan differences, because they concern a common struggle in which the Nation must be united.

1. The real source of confusion over our technical posture apparently relates to matters of time. Different estimates of how soon free world and Soviet bloc countries will have operational long-range missiles and will attain certain space objectives lead to the contradictory views which the public hears.

2. The committee is convinced from its studies that whatever the current situation is, radical technological advances on both sides of the Iron Curtain are approaching at such a headlong pace that for planning the life of the Nation it must be recognized as virtually upon us. A few years at most will bring new weapons and new space capabilities for exploration and for utilization which must make profound alterations in our ideas and our strategy.

3. It is not possible to state with certainty whether the balance will lie with the offensive or the defensive capabilities emerging from this new technology. In general, offensive powers seem greater for the next few years than any wholly successful countermeasures. This in turn affects judgments as to the dangers to civilization everywhere, and also influences views on the nature of deterrent forces.

4. This committee concludes that no one can give final answers as to the exact timetables by which the United States and the Soviet Union, in particular, will complete the development-to-operational status of their respective weapons systems and defenses. Nor is there any clue that the day can be foreseen when there will not always be more sophisticated and versatile systems coming along, demanding heavy outlays of national resources and manpower. Without picking particular years, the committee does recognize that some of the new weapons can conceivably be so decisive that there will be periods of great danger when strength may lie so much on one side as to tempt strategic planners to try to destroy much of the potential of the opponent.

5. It is an art requiring very high skill to decide what balance in the use of resources and manpower will meet both the long-range risks and the short-term threats resulting from an imbalance of power. This committee is not charged with direct responsibility for settling differences over the size of the total national budget, of which defense is the larger part. What it does note, within the framework of its responsibilities, is that there is no place for lopsided concern with either short-run or long-run problems of technology and defense. Any failure to adjust our needs to long-run requirements for support-

ing basic research and maintaining a viable economy would be a source of great danger in this age of long leadtimes. Likewise any failure to recognize short-term dangers of imbalance would run the risk that this Nation might have no future to worry about.

6. Every branch of the armed services, and all the departments of Government concerned with science, technology, and defense, are properly cognizant of our needs. They have dedicated leaders and staffs working hard to meet these challenges. They also have the means to coordinate their efforts, which are used with varying degrees of success. Many face acute problems of obtaining the budget support to do the job as well as they would like.

7. The United States is making excellent progress in visualizing its technical needs, and in shaping weapons systems. Full credit should be given to those responsible for these accomplishments. There is nothing inconsistent with this praise in also recognizing how great the need is for even more accomplishment. Indeed, we cannot afford the luxury of satisfaction, and no leader in Government or the military who appeared before this committee showed satisfaction with his accomplishments or with the resources he is able to command. This is quite an important point, for words are sufficiently inexact so that an occasional witness seemed to differ from this generalized conclusion. But in fact, the exceptions turned on qualifications which emerged in cross-examination. Particularly in the case of the NASA, the Administrator appeared satisfied with his funding, yet his view seemed tempered by shortages of trained personnel and the newness of the NASA operation.

8. Individual members of this committee were impressed in varying degree with needs for greater funding of particular service projects. The committee as a whole recognizes that some of the most desirable of the underfunded projects cannot be ready in time to meet some immediately pressing problems, but also that our thinking must reach ahead a decade and more, and our plans made accordingly. The committee also recognizes that for whatever reason, the public at large either does not yet appreciate the urgency of the times, or for other reasons is not prepared to make the sacrifices of reduced Government services, higher taxes, greater effort or productivity, or more inflation which in some combination would be required to pursue today all the alternative defense and science paths open to us. In the future, if the economy continues to grow, more such paths may be pursuable without as much cost to the routine of normal living.

9. The committee recognizes that neither it nor the Congress can make all the technical judgments involved in choosing among weapons sytems or other technical projects. But it is equally impressed that such decisions affect all of us so deeply that the people as a whole, at least through their elected representatives, must participate to the fullest extent possible. The technicians and the military can lay out alternatives, but frequently final choices are too heavy a burden for the Secretary of Defense or the President to make without the full support and understanding of the Nation.

10. The recent hearings by the Committee on Science and Astronautics, if studied by the Congress and by the public, can provide important inputs for public understanding of some of the gravest issues of our times.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

The committee heard testimony from Dr. T. Keith Glennan, Administrator; Dr. Hugh L. Dryden, Deputy Administrator; Dr. Homer Joe Stewart; Albert F. Siepert; Dr. Homer E. Newell, Jr.; DeMarquis Wyatt; Dr. Abe Silverstein; and Dr. John P. Hagen. Other NASA witnesses, in considerable numbers, have been heard on other occasions in connection with matters separately reported by the committee to the Congress.

The NASA witnesses sketched for the committee the range of programs which have been undertaken by the Space Administration since its activation last October 1, 1958. They impressed us that a great deal must be learned about the nature of the space environment before it can be used to full advantage. They also described the program of rocket boosters in assorted sizes which the national program requires. Of particular interest was the work being done under Project Mercury to put a man into orbit around the Earth. This is but a forerunner to more advanced missions. NASA witnesses also described some of the important ultimate payoffs to be expected in communications, navigation, and weather prediction. They also described the mutual interdependence between scientific investigation in general and that related to space.

During the course of the hearings, Vanguard II was put into orbit as a cloud-cover reporting satellite. It was a satisfaction that at last a Vanguard of expected size was successfully placed. It is not yet clear that the data radioed back can be used to create pictures of cloud cover from this first attempt, because of the vehicle's high rate of spin.

The NASA witnesses were given a cordial reception by the committee, and their testimony was received with real interest. At the same time, it was clear that much remained to be done to create complete communication and understanding between the Administration and the committee. The committee has an understandable desire for the maximum possible assurance that NASA plans are comprehensive and that important results are going to be attained at the earliest possible times. This is conditioned both by the great opportunities in space and by the psychological pressure of Soviet accomplishments.

A number of members of the committee were much concerned with the insistence of Dr. Glennan that he was adequately funded, when almost all aggressive department heads can identify many useful projects which are being foregone for reasons of budget limitation. Dr. Glennan could point to the rapid rise of estimated NASA expenditures, which he felt were well keyed to the ability of the new organization to expand its staff and management with properly qualified people. The committee recognized that actual expenditures were likely to run well below the authorizations because of long leadtime projects. There was some question in the minds of many members whether the NASA program, for all of its comprehensive scope, was going to compare favorably with the Soviet program, which had a much earlier start.

It might be accurate, although these things are only sensed, to say that NASA officials take their task very seriously and are aware of its immensity, but that the highest administrative officials are inclined

to put up a good front, radiating confidence, in their public pronouncements. This tendency is not necessarily bad, providing, as the committee believes, those responsible privately appreciate the dangerous race we are in, and providing the public is not falsely lulled.

The committee is intensely interested in the complex questions surrounding organizational relationships in the space field. It wants NASA to be adequately armed with facilities and talent to meet its obligations, but the committee is not in a position yet to judge the pros and cons (for example) of NASA control over the Huntsville facilities at the expense of the Army. The committee does not want to encourage any change which could have the effect of slowing our overall missile and space development.

These initial meetings between the committee and NASA were mutually useful and have subsequently been continued to create a closer tie. The committee extends to NASA warm support, but at the same time will keep seeking aspects of the NASA work which can be pushed with more speed consonant with knowledge available.

DEPARTMENT OF DEFENSE

The committee heard testimony from Secretary Neil McElroy; Gen. Nathan Twining, Chairman of the Joint Chiefs of Staff; Dr. Herbert F. York, Director of Defense Research and Engineering; Roy W. Johnson, Director of the Advanced Research Projects Agency; and William M. Holaday, Chairman of the Civilian-Military Liaison Committee and Director of Guided Missiles. Dr. York, Mr. Johnson, and their associates have been heard a number of other times on matters being separately reported to the Congress by the committee.

The Secretary of Defense discussed briefly those aspects of recent reorganization in the Department which relate to missiles, space, and technology. He presented the general view that levels of budget support represent a reasonable balance of the needs related to what is feasible.

This committee is mindful of the changing strategic outlook, and questioned the Secretary at some length over the "missile gap" of public speculation, and the shifting role of the Strategic Air Command as manned bombers give way to missiles. The committee showed a particular concern over the problems of an antimissile program. In essence, the exchanges on this subject brought agreement that research on a system such as Nike-Zeus should be pursued on the highest priority, but that no priority would make much difference in our defense posture in the next several years. On the other hand, the committee heard such differing views that it did not attempt itself to express a committee opinion on the merits of beginning work on Nike-Zeus production facilities immediately.

Dr. York had an opportunity to discuss his new organization for defense research and engineering. He also discussed in closed session the pros and cons of the Nike-Zeus approach to countering the ICBM from a technical point of view.

Roy Johnson found the greatest military interest in space to lie in the first 600 miles above the Earth, aside from certain communications satellites in fixed position relative to the Earth's equator, 22,300 miles out. Mr. Johnson left an impression that he could make good use of additional money if the budget supplied it, although he supported the budget as it is.

DEPARTMENT OF THE AIR FORCE

The committee heard testimony from Gen. Thomas D. White, Chief of Staff; Lt. Gen. Samuel E. Anderson, Commander of Air Research and Development Command; Maj. Gen. Bernard A. Schriever, Commander, Ballistic Missile Division; Brig. Gen. Homer A. Boushey, Director of Advanced Technology; Col. Charles H. Roadman, Chief of Human Factors Division, Directorate of Research and Development; and Allen F. Donovan of Space Technology Laboratories. Other Air Force witnesses have been heard on matters separately reported by this committee to the Congress.

General White used the relatively new term, "aerospace," to indicate the medium in which the Air Force believes it should operate. He identified the principal threat to the United States as lying in Soviet aerospace power, in transition from manned aircraft to ballistic missiles, eventually to spacecraft. He stressed the inseparability of scientific and military research in the area of space.

General Anderson stressed the widespread and varied technical backup the Air Force is able to provide the national space program. Approximately half the total Federal budget allocation for research and development is allocated to the ARDC of the Air Force, with the 1960 proposed funding at about the 1959 level. Apparently General Anderson's requests for funds for research and development were cut in the budgetmaking process by close to half a billion dollars.

General Schriever traced the history of the ballistic missile program, and illustrated how our space capabilities so far have largely rested on the use of military boosters. He demonstrated the very real strides that have been made under high priority for our IRBM's and ICBM's. He stressed the operational advantages which would lie with the solid-fueled Minuteman, a second generation missile still under development. General Schriever apparently is of the view that the Soviet Union has not yet brought to full operational status their ICBM's, although this time may be fairly close at hand. He also indicated frankly that it is very hard to know positively what the Soviet preparedness position is.

General Boushey traced the long-term Air Force contributions to the national space program, and showed that control over many of these devices and programs has been passed to other hands. Although Air Force witnesses did not challenge these transfers, their testimony reflected a certain disappointment at losing direct control over work of such interest to the Air Force.

DEPARTMENT OF THE ARMY

The committee heard testimony from Secretary Wilber M. Brucker; accompanied by Gen. Lyman Lemnitzer; Brig. Gen. John A. Barclay, Commander, U.S. Army Ballistic Missile Agency; Maj. Gen. W. W. Dick, Director of Special Weapons, Office of Chief of Research and Development; Maj. Gen. D. E. Beach, Director of Air Defense and Special Weapons, Deputy Chief of Staff for Military Operations; and Dr. Wernher von Braun, Director, Development Operations Division, Army Ballistic Missile Agency.

Secretary Brucker demonstrated that the Army showed considerable foresight over the years in recognizing the potentialities of rockets

and missiles, including support of the important Jet Propulsion Laboratories which have now been transferred to NASA, and the strong team of German rocket experts nurtured by the Army since the close of World War II.

General Barclay discussed the terms of cooperation between NASA and the Army with regard to the facilities and personnel of ABMA at Huntsville, Ala. The Huntsville facilities were deemed important to continuing Army needs in missile development, but at the same time were shown to be available for such key projects as the ARPA meteorological satellite program and the large million-and-a-half-pound thrust clustered booster, as well as the Redstone and Jupiter booster phases of NASA's Project Mercury. The Army looks forward to the time when missiles can be used to deliver priority cargo and personnel in a matter of minutes to any required destination.

Dr. von Braun gave a very graphic description of the potentialities of space flight. Under cross-examination, he brought forth the information that he felt the Juno V (Saturn) million-and-a-half-pound thrust booster program could proceed on a sounder basis with considerably more money both in what is left of fiscal year 1959 and in 1960. He subsequently received additional 1959 funds, and the 1960 allotment was still under review at the time of this report.

General Dick developed in greater detail the specifics of Army interest in space, including the fields of survey and geodesy, communications, meteorology, intelligence, and space defense.

General Beach made a strong case for all-out development of the Nike-Zeus AICBM, including a current start on production facilities. He admitted that there were still unanswered questions about the system, but expressed strong confidence that these would be solved as they arose, and that the savings of time from a current start on production work might be of crucial importance to availability of this defense at the earliest possible date. This view of the antimissile program was matched by those of the Department of Defense witnesses insofar as the urgency of the research effort was concerned. But Army confidence in the decision to proceed now to production preparations was in sharp contrast to the skepticism among top DOD witnesses that research had proceeded far enough. The only certain committee recommendation under the circumstances can be continued close monitoring of the situation for the first hints that a clear-cut disinterested decision could be made.

Although the difference may be one of emphasis, the committee detected some difference of philosophy between the Army and the Air Force on air defense. In simple terms, the Air Force seemed to describe its approach as area defense, the Army as point defense. The Air Force seemed to feel that point defense could be impossibly expensive and allow the enemy to approach too close to vital targets. The Army seemed to feel that area defense represented a risk that outlying defenses once penetrated would leave a hollow shell, and that too much depended upon the success of long-distance communications which might be subject to interruption. It appeared to the committee that there was much merit on both sides, and, as is often the case, to satisfy both completely would be very expensive. The important consideration would seem to be that the blind spots of a single service should not be allowed to dominate policy, and that the

very best technical and military analysis should settle any controversy independent of the budgetary interests of a single service.

DEPARTMENT OF THE NAVY

The committee heard testimony from Rear Adm. John T. Hayward, Assistant Chief of Naval Operations (Research and Development); Rear Adm. K. S. Masterson, Director of the Guided Missile Division; Rear Adm. W. F. Raborn, Director of Special Projects; and Capt. E. O. Wagner, Coordinator of Missile Ranges, Office of Deputy Chief of Naval Operations (Air). Other Navy witnesses have been heard on matters separately reported by this committee to the Congress.

Admiral Hayward, like representatives of the other services, demonstrated a wide spread of space projects in which the Navy has a keen interest, and to which it has made marked contributions. The first Navy proposals for artificial satellites came as early as 1942. Admiral Hayward made a strong plea for recognition that war represents a challenge across an entire spectrum, including not only the war of annihilation by hydrogen bomb, but everything ranging down to the showing of the flag in cold-war situations.

Admiral Hayward sparked considerable interest with his challenge that the real threat to our space progress is not lack of talent, but the bureaucratic tangle which exists, and which divides the space program into many parts. This view was in contrast to the assurances of other witnesses that all relations among services, with ARPA, and with NASA are quite satisfactory, and that the means for consultation and settlement of questions are adequate.

Admiral Hayward made a special point of stressing the across-the-board nature of science, and how important basic research and component research are, as well as work on entire weapons systems. He expressed particular pride in Navy support of such research even in times of budgetary stringency. He also gave direct answers as to how sharply his budget requests had been cut by higher authority, with real damage, in his view, to areas of study important to our future defense. He said his requests were cut $270 million.

The committee entertained sympathy for Admiral Hayward who colorfully observed that when the press reports intragovernmental differences, Congress "debates," the Supreme Court "deliberates," but the armed services "bicker." He stated that almost all service people at the working level are very cooperative. The problem in a bureaucracy is that there are many more people who can say "No" to projects than are willing and able to say "Yes."

Admiral Masterson presented a general review of Navy missile programs, designed for a variety of purposes. Admiral Raborn in open session was able to give a brief introduction to the Polaris system of ballistic missiles. These are intended to have the range of intermediate missiles, but to do the job of ICBM's through launchings from submarines. They would be relatively invulnerable from ballistic counterattack or surprise attack because the submarines' locations would not be known to the enemy for the time required to use ballistic weapons against them. With nuclear power, they might well escape most forms of detection which conventional submarines risk.

Captain Wagner described the expanding facilities of the Pacific Missile Range, demonstrating that it is needed for polar orbit launchings, and for operational training, inasmuch as the Atlantic Missile Range has a heavy schedule of research and development work. The Pacific Range is also seen as important to future AICBM experiments and to equatorial launchings.

CENTRAL INTELLIGENCE AGENCY

Director Allen W. Dulles appeared in closed session with his associates to give the committee the best available picture of the status of Soviet missile and space developments. In order to protect the sources and the methods of analysis used by our intelligence community in arriving at national estimates it is not possible to discuss in detail the conclusions reported to the committee. In general, the indication was that the Soviet Union has a formidable program underway of grave concern to our national welfare, but also that there are some of the same kinds of problems involved in perfecting Soviet capabilities as apply in the United States or in any other country.

NATIONAL TRACKING PROGRAM

Because it served to illustrate the problems of program coordination inherent in a complex new technology involving many interests, the committee spent part of one session examining the basis of press statements that liaison and cooperation among elements of our national space program were far from perfect. Tracking problems were a good illustration.

When Discoverer I was launched, telemetry was complete for the first 9 minutes, enough to establish the kind of orbit it would enter. Thereafter, radio signals received were sporadic, and it was some days before the ARPA and Air Force could be sure it was in orbit. There were rumors from other sources that it never was in orbit.

Newspaper accounts reported that Prof. J. Allen Hynek, Associate Director of the Smithsonian Astrophysical Observatory in Cambridge, Mass., was not notified in advance of the Discoverer launching so that the Moonwatch team of satellite visual observers was not enlisted to find the missing Discoverer and to establish with certainty its orbit.

When the committee called Dr. Hynek to testify, it developed that the time of launching of Discoverer into its polar orbit so placed it that it would not be visible to the chain of visual observation stations during its 30-day expected lifetime. Some members of the committee wondered whether ARPA should not have consulted the Smithsonian Observatory in order to pick a launch time which would afford use of the visual search network. The ARPA answer was that times had been chosen to maximize the checkout of radio stations and other facilities in the Pacific in preparation for command signals connected with recovery of capsules from later launchings.

The committee conclusion was that in this instance, there was perhaps no need to coordinate this particular experiment with all the conceivable agencies. The Discoverer series is intended to advance scientific knowledge and is not in itself a military threat to any other nation. At the same time, like Soviet scientific launchings of 1957–58, it is intimately associated with military facilities and future projects.

Accordingly, there may be a place for some separation of military and civilian space activities. This certainly is implicit in the National Aeronautics and Space Act.

The committee is mindful, however, that the act also called for a maximum of cooperation, coordination, and overall programing. What the committee felt was that the arrangements for the Discoverer launching were quite probably correct in this instance. But the committee is also aware that there remains an undercurrent of uncertainty, and possibly some mutual distrust between elements of the scientific community and persons in the Defense Establishment. This is not something which can be solved overnight, and probably mutual understanding is today at a higher level than it has been in some past years. There must be a continuing effort to recognize genuine security needs which may involve some parallel development and classification of information. There must also be searching examination of plans to separate and to classify to insure that our own work is not hampered, and that information so restricted is truly not available to potential enemies. In some instances, greater freedom of information may pay dividends to our own research efforts even at the price of showing a few shortcuts to our rivals.

CONCLUSION

The committee views this as but the first of a number of reports which will be required to aid the Congress and the public in acquiring a better appreciation of where we stand. We recognize that few individuals will have the opportunity to study in detail the printed record of these hearings, even aside from the problem of making the necessary excisions which have been required in transcripts of executive sessions, thereby limiting the information generally available.

The committee has adopted the practice of submitting its executive transcripts to the agency appearing before it, to insure that the maximum information which can be disclosed with safety is made available. This is important to proper public understanding.

The committee believes that our scientific and technical endeavors, both for defense, and for general human betterment must have a very high priority in our allocation of funds, resources, and manpower. What is done today, often with only partly predictable results, will determine our fate in the years to come.

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